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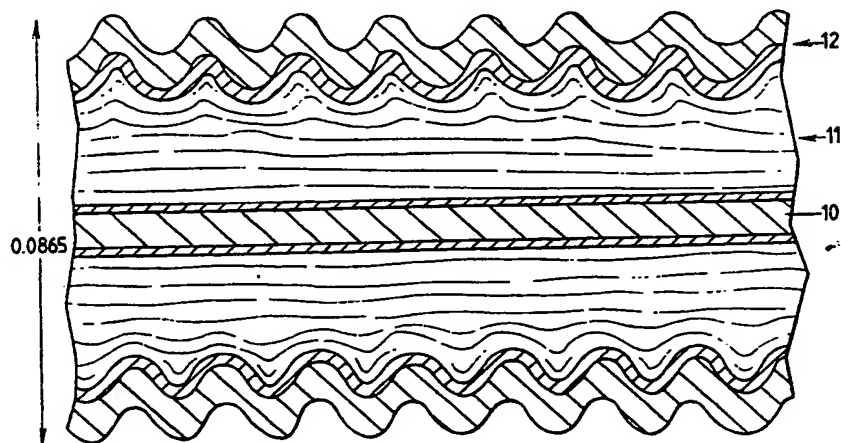
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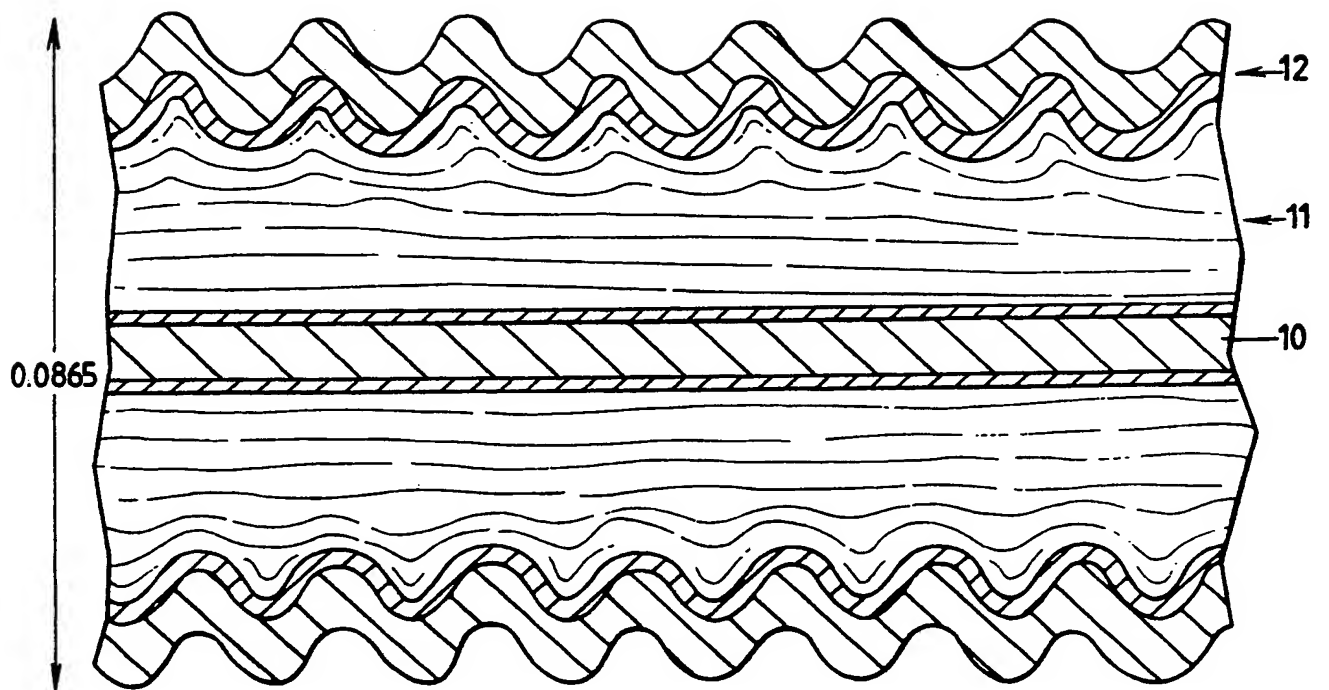
(56) Documents cited
**GB 1453786 GB 1158485 GB 1077425
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(58) Field of search
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Selected US specifications from IPC sub-class
H01B**

(54) Microwave transmission coaxial cable

(57) A semi-rigid microwave transmission coaxial cable having a finely pitched convoluted outer conductor 12 arranged such that the cable can be bent, straightened and rebent when required without any or significant deterioration to its physical and electrical properties, in which the cable has a dielectric 11 made from PTFE wrapped around an inner conductor 10 before it is inserted into the outer conductor 12. The inner conductor 10 may be stainless coated with copper, the copper having an optional layer of silver. The outer conductor 12 is a tube of stainless steel with an inner coating or foil of copper, the copper optionally having a coating of silver. Alternatively the outer conductor may be phosphor bronze.





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CABLE

This invention relates to coaxial cables for use in transmission of microwave electrical signals.

Cable runs for microwave transmissions are often complex and in more than one plane. In practice for such runs and interconnections, three-dimensional representations or engineering drawings must be carefully prepared, and where the cable is to execute bends, a semi-rigid cable used and precisely formed in accordance with the drawings. No significant configuration changes are possible once the cable has been bent and it certainly cannot be straightened and bent a second time without permanent damage. Even if the cable is bent correctly to the drawings, the cost of supplying the cable plus the cost preparing the required drawings represents the true materials cost for any job.

According to the present invention there is provided a semi-rigid microwave transmission coaxial cable having a finely pitched convoluted outer conductor arranged such that the cable can be bent, straightened and rebent when required without any or significant deterioration to its physical and electrical properties.

For high frequency cable for use at around 18 Gigahertz for example, the pitch of the convolutions is preferably in the range of 15 to 35 turns per inch but could be higher (6 to 14 turns per centimetre). The convolutions can have zero pitch in which case 15 to 35 pairs of distinct ridges and troughs are formed side by side in the outer conductor per inch.

The dielectric is preferably PTFE and formed by a low loss PTFE tape wrapped around the inner conductor before it is inserted into the outer conductor.

The inner conductor is preferably stainless steel coated with copper, the copper may be coated with a layer of silver.

The cable is formed by inserting the inner conductor and the dielectric together into the outer conductor in the form of a uniform tube. The cable is then preferably passed through a spinning type thread forming die which forms the convolutions in the outer conductor in a single operation. The troughs of the convolutions press inwards against and impinge into the dielectric to some extent to prevent movement thereafter of the dielectric relative to the outer conductor in a direction along the longitudinal axis of the cable.

For certain applications such as in some aircraft, the outer conductor is preferably formed of phosphor bronze and the inner conductor made of oxygen-free copper.

A semi-rigid microwave low loss transmission co-axial cable according to the invention will now be described by way of example with reference to the accompanying schematic drawing which shows a cross-sectional elevation of part of the cable.

Referring to the drawing, an inner conductor 10 is 0.024 inches in diameter but this depends on the dielectric material chosen and is made of steel coated with copper about 0.003 inches thick or copper alone. The copper is coated with silver about 0.0002 inches thick. A low loss PTFE dielectric tape 11 is wrapped around the inner conductor. A tube of PTFE or other dielectric material can also be used.

An outer conductor 12 consists of a tube of stainless steel 0.0045 to 0.0055 inches thick with an inner coating or foil of

copper 0.003 to 0.004 inches thick. The inside of the copper can be coated with a layer of silver 0.0002 inches thick. The outside diameter of the described cable is 0.0865 inches approximately but depends on the impedance required. The convolutions are 0.005 to 0.007 inches deep and there are 35 turns per inch run of the cable.

Clearly other similar diameter cables can be formed and, for example, for cables of diameter 0.086, 0.096, 0.141 and 0.250 inches the preferred convolutions are arranged at 35, 31, 26 and 15 turns per inch.

It will also be noted that other suitable ductile materials may be used for the conductors. Cables according to the invention can be of high strength as well easy to bend, at least to the extent required for use. The working temperature range can be substantial and there is no need after bending to carry out the normal temperature cycling for stress relieving as with present non-convoluted semi-rigid cables. Importantly, no special drawings are required when these new cables are used and as the cable can be straightened and re-bent when required, there is little or no inherent loss of cable lengths during assembly of cable runs and connections even if the cable has to be re-positioned after first assembly.

CLAIMS

1. A semi-rigid microwave transmission coaxial cable having a finely pitched convoluted outer conductor arranged such that the cable can be bent, straightened and rebent when required without any or significant deterioration to its physical and electrical properties.
2. A cable according to claim 1, in which the pitch of the convolutions is in the range of 15 to 35 turns per inch.
3. A cable according to claim 1, in which the convolutions have zero pitch in which case 15 to 35 pairs of distinct ridges and troughs are formed side by side in the outer conductor per inch.
4. A cable according to any of claims 1 to 3, in which the cable has a dielectric made from PTFE wrapped around an inner conductor before it is inserted into the outer conductor.
5. A cable according to any preceding claim, in which the inner conductor is stainless steel coated with copper.
6. A cable according to claim 5, in which the copper is coated with a layer of silver.
7. A cable according to any of claims 1 to 4, in which the inner conductor is made from oxygen free copper.
8. A cable according to any preceding claim, in which the outer conductor is made from phosphor bronze.

9. A cable according to any preceding claim, in which the convolutions in the outer conductor are formed by a spinning type thread forming die.

10. A cable substantially as hereinbefore described with reference to the accompanying drawing.